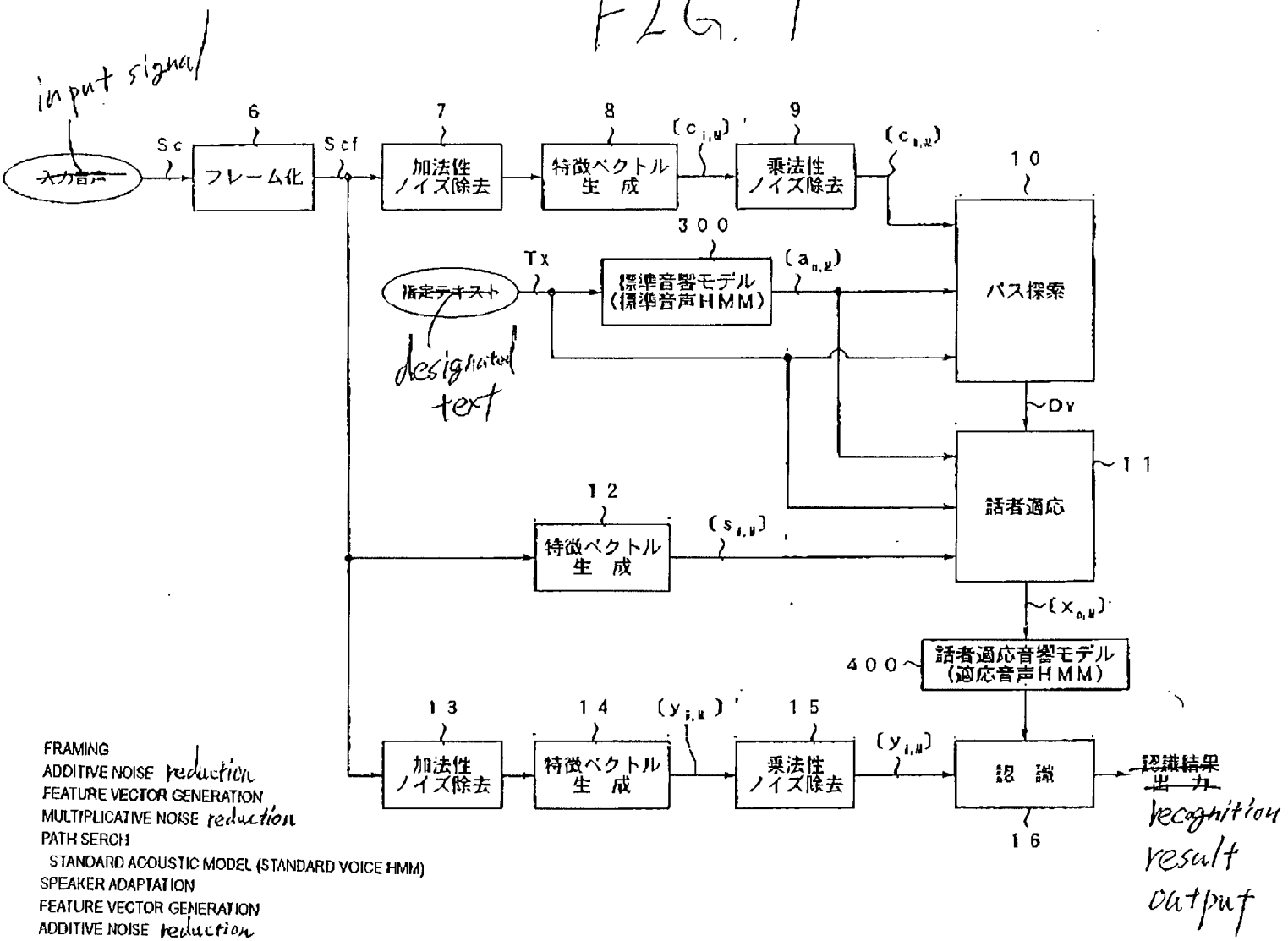
01- 9-27; 5:51PM;NGB MORGAN, LEWIS ;8135561395 4 # A- 36

FIG. 1



6: FRAMING
7: ADDITIVE NOISE reduction
8: FEATURE VECTOR GENERATION
9: MULTIPLICATIVE NOISE reduction
10. PATH SERCH
300: STANDARD ACOUSTIC MODEL (STANDARD VOICE HMM)
11: SPEAKER ADAPTATION
12 FEATURE VECTOR GENERATION
13: ADDITIVE NOISE reduction
14: FEATURE VECTOR GENERATION
15: MULTIPLICATIVE NOISE reduction
16: RECOGNITION
400 SPEAKER ADAPTIVE ACOUSTIC MODEL (ADAPTIVE VOICE HMM)

Fig. 2

syllable

standard vector

State number n	音韻	標準ベクトル $[a_{n,M}]$
1	あA	$[a_{1,1}\ a_{1,2}\ a_{1,3}\ \cdots\cdots\ a_{1,M}]$
2	いI	$[a_{2,1}\ a_{2,2}\ a_{2,3}\ \cdots\cdots\ a_{2,M}]$
3	うU	$[a_{3,1}\ a_{3,2}\ a_{3,3}\ \cdots\cdots\ a_{3,M}]$
4	えE	$[a_{4,1}\ a_{4,2}\ a_{4,3}\ \cdots\cdots\ a_{4,M}]$
5	おO	$[a_{5,1}\ a_{5,2}\ a_{5,3}\ \cdots\cdots\ a_{5,M}]$
6	かKA	$[a_{6,1}\ a_{6,2}\ a_{6,3}\ \cdots\cdots\ a_{6,M}]$
⋮	⋮	⋮
10	こKO	$[a_{10,1}\ a_{10,2}\ a_{10,3}\ \cdots\cdots\ a_{10,M}]$
11	さSA	$[a_{11,1}\ a_{11,2}\ a_{11,3}\ \cdots\cdots\ a_{11,M}]$
⋮	⋮	⋮
16	たTA	$[a_{16,1}\ a_{16,2}\ a_{16,3}\ \cdots\cdots\ a_{16,M}]$
17	ちTI	$[a_{17,1}\ a_{17,2}\ a_{17,3}\ \cdots\cdots\ a_{17,M}]$
⋮	⋮	⋮
21	なNA	$[a_{21,1}\ a_{21,2}\ a_{21,3}\ \cdots\cdots\ a_{21,M}]$
22	にNI	$[a_{22,1}\ a_{22,2}\ a_{22,3}\ \cdots\cdots\ a_{22,M}]$
⋮	⋮	⋮
26	はHA	$[a_{26,1}\ a_{26,2}\ a_{26,3}\ \cdots\cdots\ a_{26,M}]$
⋮	⋮	⋮
31	まMA	$[a_{31,1}\ a_{31,2}\ a_{31,3}\ \cdots\cdots\ a_{31,M}]$
⋮	⋮	⋮
36	やYA	$[a_{36,1}\ a_{36,2}\ a_{36,3}\ \cdots\cdots\ a_{36,M}]$
37	ゆYU	$[a_{37,1}\ a_{37,2}\ a_{37,3}\ \cdots\cdots\ a_{37,M}]$
38	よYO	$[a_{38,1}\ a_{38,2}\ a_{38,3}\ \cdots\cdots\ a_{38,M}]$
39	らRA	$[a_{39,1}\ a_{39,2}\ a_{39,3}\ \cdots\cdots\ a_{39,M}]$
⋮	⋮	⋮
44	わWA	$[a_{44,1}\ a_{44,2}\ a_{44,3}\ \cdots\cdots\ a_{44,M}]$
45	をWO	$[a_{45,1}\ a_{45,2}\ a_{45,3}\ \cdots\cdots\ a_{45,M}]$
46	んN	$[a_{46,1}\ a_{46,2}\ a_{46,3}\ \cdots\cdots\ a_{46,M}]$
⋮	⋮	⋮
N	:	$[a_{N,1}\ a_{N,2}\ a_{N,3}\ \cdots\cdots\ a_{N,M}]$

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Fig. 3

AT THE TIME OF SPEAKER ADAPTATION, FEATURE VECTOR [s1, M] GENERATED IN THE FEATURE VECTOR GENERATION SECTION 12

Flame number

Time

~~フレーム番号~~ i	話者適応の際に特徴ベクトル生成部１２で生成される特徴ベクトル〔S 1, M〕
1	〔S 1, 1 S 1, 2 S 1, 3 …… S 1, M 〕
2	〔S 2, 1 S 2, 2 S 2, 3 …… S 2, M 〕
3	〔S 3, 1 S 3, 2 S 3, 3 …… S 3, M 〕
4	〔S 4, 1 S 4, 2 S 4, 3 …… S 4, M 〕
5	〔S 5, 1 S 5, 2 S 5, 3 …… S 5, M 〕
6	〔S 6, 1 S 6, 2 S 6, 3 …… S 6, M 〕
7	〔S 7, 1 S 7, 2 S 7, 3 …… S 7, M 〕
8	〔S 8, 1 S 8, 2 S 8, 3 …… S 8, M 〕
9	〔S 9, 1 S 9, 2 S 9, 3 …… S 9, M 〕
10	〔S 10, 1 S 10, 2 S 10, 3 …… S 10, M 〕
11	〔S 11, 1 S 11, 2 S 11, 3 …… S 11, M 〕
12	〔S 12, 1 S 12, 2 S 12, 3 …… S 12, M 〕
13	〔S 13, 1 S 13, 2 S 13, 3 …… S 13, M 〕
14	〔S 14, 1 S 14, 2 S 14, 3 …… S 14, M 〕
15	〔S 15, 1 S 15, 2 S 15, 3 …… S 15, M 〕
16	〔S 16, 1 S 16, 2 S 16, 3 …… S 16, M 〕
17	〔S 17, 1 S 17, 2 S 17, 3 …… S 17, M 〕
18	〔S 18, 1 S 18, 2 S 18, 3 …… S 18, M 〕
19	〔S 19, 1 S 19, 2 S 19, 3 …… S 19, M 〕
20	〔S 20, 1 S 20, 2 S 20, 3 …… S 20, M 〕
⋮	⋮
29	〔S 29, 1 S 29, 2 S 29, 3 …… S 29, M 〕
30	〔S 30, 1 S 30, 2 S 30, 3 …… S 30, M 〕

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Fig. 4

Flame number

AT THE TIME OF SPEAKER ADAPTATION, FEATURE VECTOR [ci, M] OUTPUTTED FROM MULTIPLICATIVE NOISE REMOVAL SECTION 9

Time
~~時間~~

~~フレーム番号~~ i	話者適応の際に乗法性ノイズ除去部9から出力される特徴ベクトル〔C 1, M〕
1	[C 1, 1 C 1, 2 C 1, 3 ..... C 1, M]
2	[C 2, 1 C 2, 2 C 2, 3 ..... C 2, M]
3	[C 3, 1 C 3, 2 C 3, 3 ..... C 3, M]
4	[C 4, 1 C 4, 2 C 4, 3 ..... C 4, M]
5	[C 5, 1 C 5, 2 C 5, 3 ..... C 5, M]
6	[C 6, 1 C 6, 2 C 6, 3 ..... C 6, M]
7	[C 7, 1 C 7, 2 C 7, 3 ..... C 7, M]
8	[C 8, 1 C 8, 2 C 8, 3 ..... C 8, M]
9	[C 9, 1 C 9, 2 C 9, 3 ..... C 9, M]
10	[C 10, 1 C 10, 2 C 10, 3 ..... C 10, M]
11	[C 11, 1 C 11, 2 C 11, 3 ..... C 11, M]
12	[C 12, 1 C 12, 2 C 12, 3 ..... C 12, M]
13	[C 13, 1 C 13, 2 C 13, 3 ..... C 13, M]
14	[C 14, 1 C 14, 2 C 14, 3 ..... C 14, M]
15	[C 15, 1 C 15, 2 C 15, 3 ..... C 15, M]
16	[C 16, 1 C 16, 2 C 16, 3 ..... C 16, M]
17	[C 17, 1 C 17, 2 C 17, 3 ..... C 17, M]
18	[C 18, 1 C 18, 2 C 18, 3 ..... C 18, M]
19	[C 19, 1 C 19, 2 C 19, 3 ..... C 19, M]
20	[C 20, 1 C 20, 2 C 20, 3 ..... C 20, M]
⋮	⋮
29	[C 29, 1 C 29, 2 C 29, 3 ..... C 29, M]
30	[C 30, 1 C 30, 2 C 30, 3 ..... C 30, M]

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Fig. 5

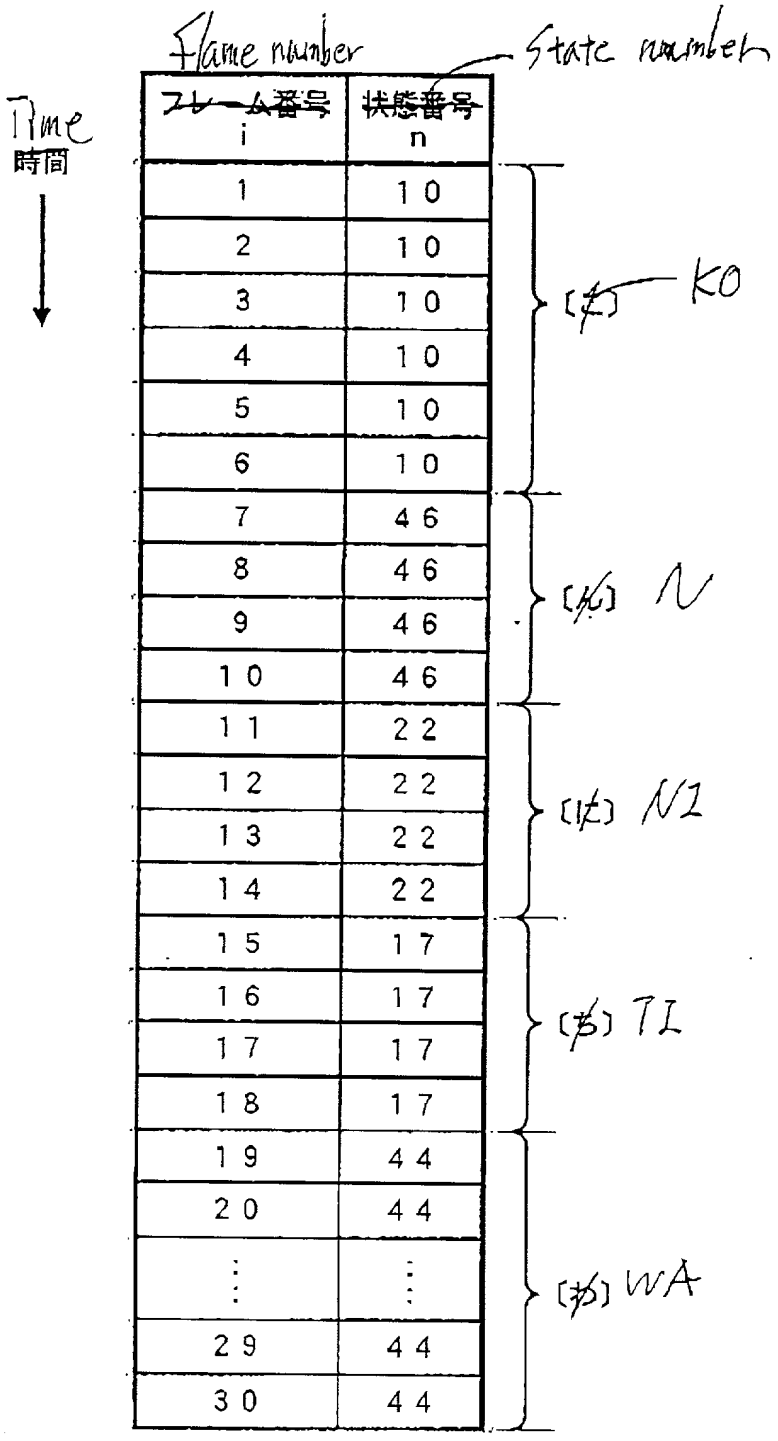

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Fig.6

フレーム番号 i (Flame number)	特徴ベクトル [S i, μ] (Feature vector)	状態番号 n (State number)	標準ベクトル [a n, μ] (Standard)	
1	[S 1, 1 … S 1, M]	10	[a 10, 1 … a 10, M]	[ア] K0
2	[S 2, 1 … S 2, M]	10	[a 10, 1 … a 10, M]	
3	[S 3, 1 … S 3, M]	10	[a 10, 1 … a 10, M]	
4	[S 4, 1 … S 4, M]	10	[a 10, 1 … a 10, M]	
5	[S 5, 1 … S 5, M]	10	[a 10, 1 … a 10, M]	
6	[S 6, 1 … S 6, M]	10	[a 10, 1 … a 10, M]	
7	[S 7, 1 … S 7, M]	46	[a 46, 1 … a 46, M]	[ン] N
8	[S 8, 1 … S 8, M]	46	[a 46, 1 … a 46, M]	
9	[S 9, 1 … S 9, M]	46	[a 46, 1 … a 46, M]	
10	[S 10, 1 … S 10, M]	46	[a 46, 1 … a 46, M]	
11	[S 11, 1 … S 11, M]	22	[a 22, 1 … a 22, M]	[キ] N2
12	[S 12, 1 … S 12, M]	22	[a 22, 1 … a 22, M]	
13	[S 13, 1 … S 13, M]	22	[a 22, 1 … a 22, M]	
14	[S 14, 1 … S 14, M]	22	[a 22, 1 … a 22, M]	
15	[S 15, 1 … S 15, M]	17	[a 17, 1 … a 17, M]	[ヲ] T2
16	[S 16, 1 … S 16, M]	17	[a 17, 1 … a 17, M]	
17	[S 17, 1 … S 17, M]	17	[a 17, 1 … a 17, M]	
18	[S 18, 1 … S 18, M]	17	[a 17, 1 … a 17, M]	
19	[S 19, 1 … S 19, M]	44	[a 44, 1 … a 44, M]	[ホ] WA
20	[S 20, 1 … S 20, M]	44	[a 44, 1 … a 44, M]	
⋮	⋮	⋮	⋮	
29	[S 29, 1 … S 29, M]	44	[a 44, 1 … a 44, M]	
30	[S 30, 1 … S 30, M]	44	[a 44, 1 … a 44, M]	

0960927.092904

FIG. 7

		average feature vector 平均特徴ベクトル $[\hat{s}_{n,u}]$	state number 状態番号 n	Standard vector 標準ベクトル $[a_{n,u}]$	
average of	i = 1 ~ 6 の平均	$[\hat{s}_{10,1} \cdots \hat{s}_{10,M}]$	10	$[a_{10,1} \cdots a_{10,M}]$	← [ク] KO
average of	i = 7 ~ 10 の平均	$[\hat{s}_{46,1} \cdots \hat{s}_{46,M}]$	46	$[a_{46,1} \cdots a_{46,M}]$	← [ん] N
average of	i = 11 ~ 14 の平均	$[\hat{s}_{22,1} \cdots \hat{s}_{22,M}]$	22	$[a_{22,1} \cdots a_{22,M}]$	← [ス] NI
average of	i = 15 ~ 18 の平均	$[\hat{s}_{17,1} \cdots \hat{s}_{17,M}]$	17	$[a_{17,1} \cdots a_{17,M}]$	← [ヨ] TI
average of	i = 19 ~ 30 の平均	$[\hat{s}_{44,1} \cdots \hat{s}_{44,M}]$	44	$[a_{44,1} \cdots a_{44,M}]$	← [ヲ] WA

0 5 9 4 6 7 7 · 0 9 2 8 0 4

FIG. 8

State number

syllable

Adaptive vector of acoustic H/M/M after updated

状態番号 n	音節	更新後の更新音声HMMの適応ベクトル
1	あ/A	[X1.1 X1.2 X1.3 ····· X1.M]
2	い/I	[X2.1 X2.2 X2.3 ····· X2.M]
3	う/U	[X3.1 X3.2 X3.3 ····· X3.M]
4	え/E	[X4.1 X4.2 X4.3 ····· X4.M]
5	お/O	[X5.1 X5.2 X5.3 ····· X5.M]
6	か/KA	[X6.1 X6.2 X6.3 ····· X6.M]
⋮	⋮	⋮
10	こ/KO	[X10.1 X10.2 X10.3 ····· X10.M]
11	さ/SA	[X11.1 X11.2 X11.3 ····· X11.M]
⋮	⋮	⋮
16	た/TA	[X16.1 X16.2 X16.3 ····· X16.M]
17	て/TE	[X17.1 X17.2 X17.3 ····· X17.M]
⋮	⋮	⋮
21	な/NA	[X21.1 X21.2 X21.3 ····· X21.M]
22	に/NI	[X22.1 X22.2 X22.3 ····· X22.M]
⋮	⋮	⋮
26	は/HA	[X26.1 X26.2 X26.3 ····· X26.M]
⋮	⋮	⋮
31	ま/MA	[X31.1 X31.2 X31.3 ····· X31.M]
⋮	⋮	⋮
36	や/YA	[X36.1 X36.2 X36.3 ····· X36.M]
37	ゆ/YU	[X37.1 X37.2 X37.3 ····· X37.M]
38	よ/YO	[X38.1 X38.2 X38.3 ····· X38.M]
39	ら/RA	[X39.1 X39.2 X39.3 ····· X39.M]
⋮	⋮	⋮
44	わ/WA	[X44.1 X44.2 X44.3 ····· X44.M]
45	を/WO	[X45.1 X45.2 X45.3 ····· X45.M]
46	ん/N	[X46.1 X46.2 X46.3 ····· X46.M]
⋮	⋮	⋮
N	:	[XN.1 XN.2 XN.3 ····· XN.M]

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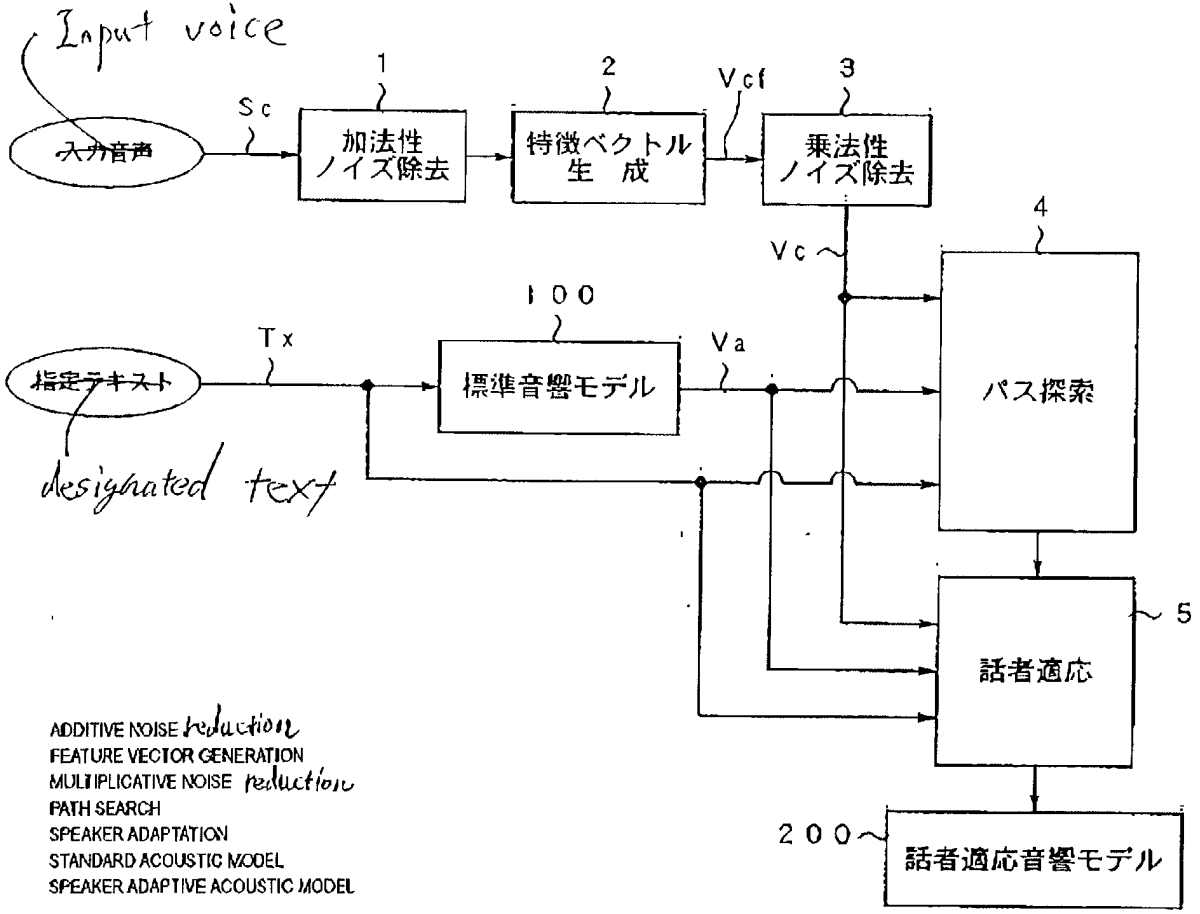
FIG. 9



1: ADDITIVE NOISE reduction
2: FEATURE VECTOR GENERATION
3: MULTIPLICATIVE NOISE reduction
4: PATH SEARCH
5: SPEAKER ADAPTATION
100 STANDARD ACOUSTIC MODEL
200: SPEAKER ADAPTIVE ACOUSTIC MODEL